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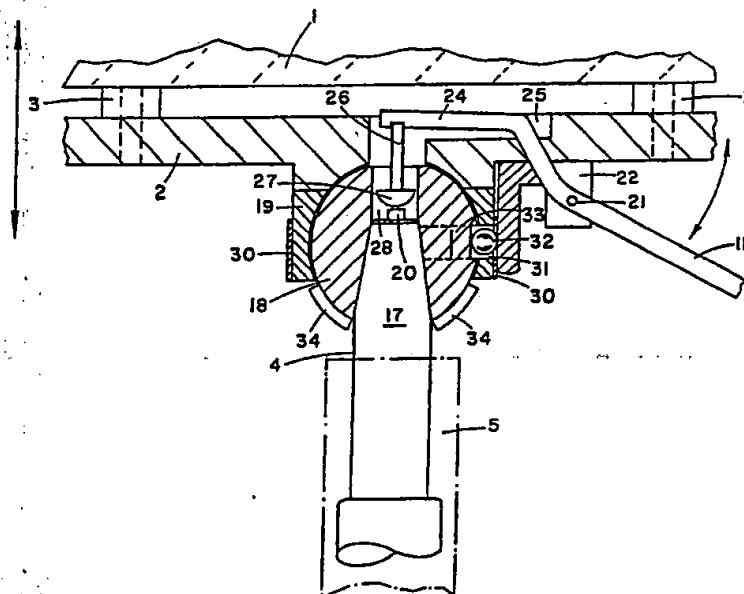
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INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

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(54) Title: SWIVEL CHAIR WITH TILTABLE SEAT AND A MECHANISM THEREFOR



(57) Abstract

A reclining swivel chair in which the seat (1) is linked to a central post (4) by a ball-and-socket joint (18, 19), preferably of plastic material, which provides for both tilting and swivelling. The seat (1) can be fixed in a given reclination by means of a mechanism (30) which tightens the socket (19) to the ball (18) and the extend of reclination is limited by stop members (34).

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SWIVEL CHAIR WITH TILTABLE SEAT AND A MECHANISM THEREFOR**FIELD OF THE INVENTION**

The present invention concerns a swivel chair suitable, for example, for office use, and aims at providing such a chair in which the seat is tiltable and may be fixed
5 at a desired tilt without hampering its swivelling capacity.

SUMMARY OF THE INVENTION

The invention provides a reclining swivel chair having a seat and back and comprising in combination:

- 10 i) a central post supported by a base portion and carrying at its top end a ball member rigidly mounted thereon;
- ii) a seat-bearing plate having upper and lower faces and bearing the seat on its upper face;
- 15 iii) a boss projecting downward from the lower face of said seat-bearing plate and having a spherical socket receiving said ball member of the central post to form therewith a ball-and-socket joint whereby said seat-bearing plate is capable of articulation by way of swivelling and
20 tilting;

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iv) a hoop member around said boss and associated with manually operable means for tensioning the hoop member into a locking position in which said boss is locked on said ball member and a releasing position in which said boss can
5 freely be articulated around said ball member; and

v) ball-bearing means within said ball-and-socket joint to enable swivelling of the seat when said spherical socket is locked on said ball member.

In operation, when said manually operable means
10 for tensioning the hoop member are shifted into the releasing position the ball-and-socket joint formed between the seat-bearing plate and the post enables tilting of the seat. By shifting the said manually operable means for tensioning the hoop member into the locking position, the
15 boss is locked on the ball member whereby the seat is fixed horizontally or in any desired tilt.

Preferably the ball member comprises on its periphery stops which limit the extent of articulation of said ball-and-socket joint and consequently the extent to
20 which the seat may be tilted.

In a swivel chair according to the invention the said central post is associated with means for adjustment of the height of the seat. In accordance with one embodiment of this aspect of the invention the said central post of the
25 chair is associated with a pneumatic or hydraulic system which upon actuation raises and lowers the seat at will.

The invention also provides a tilting and swivel mechanism as defined above.

30 DESCRIPTION OF THE DRAWINGS

For better understanding the invention will now be described, by way of example, with reference to the annexed drawings, it being understood that the invention is not confined thereto. In the drawings:

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Fig. 1 is a front view of a reclining swivel chair according to the invention;

Fig. 2 is a rear view of the chair of Fig. 1;

Fig. 3 is a first side view of the chair of Fig. 1;

5 Fig. 4 is a second side view of the chair of Fig. 1;

Fig. 5 is a bottom view of the chair of Figs. 1 to 4 with the center post and base portion being removed;

Fig. 6 is a bottom view of the seat-bearing plate in a chair of Figs. 1 to 4 drawn to a larger scale;

10 Fig. 7 is a section along line VII-VII of Fig. 6;

Fig. 8 is a section along line VIII-VIII of Fig. 6;

Fig. 9 is a section along line IX-IX of Fig. 8;

Fig. 10 is a section along line X-X of Fig. 6; and

Fig. 11 is a section along line XI-XI of Fig. 10.

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DESCRIPTION OF A SPECIFIC EMBODIMENT

Attention is first directed to Figs. 1 to 4. As shown, a reclining swivel chair according to the invention comprises a seat 1 fastened onto a seat-bearing plate 2 with interposition of a plurality of spacers 3. The seat-bearing plate 2 is borne by a central post 4 whose lower part is held by a base portion 5 comprising three feet 6 each fitted with a castor wheel 7.

25 Connected to base plate 2 is a gripper assembly 8 holding a prismatic rod 9 supporting a back 10.

The reclining swivelling chair according to the invention here shown further comprises levers for the following manipulations: lever 11 for the actuation of a hydraulic system by which the level of the seat assembly 1, 2 is adjustable; lever 12 for locking and unlocking gripper assembly 8 for vertical adjustment of the back 10; lever 13 for locking and unlocking a hoop surrounding a ball-and-socket joint between the seat-bearing plate and the central post thereby to enable tilting of the seat; and lever 14 for
35 the adjustment of the angular position of the back 10.

The manner in which each of levers 11, 12, 13 and 14 controls an associated mechanism will now be described with reference to Figs. 5 to 11.

Turning first to Figs. 5, 6 and 7 it is seen that the central post 4 has an upper tapering portion 17 which fits snugly into a correspondingly shaped lower bore of a ball member 18 located within a spherical socket in a downward depending boss 19 of the seat-bearing plate 2. The upper end of the tapering end portion 17 of central post 4 bears an actuator 20 of a hydraulic system capable of lifting and lowering post 4.

Lever 11 which has a double bent shape as shown in Fig. 7 is hinged on a pivot 21 located within a casing 22. The first end portion of lever 11 bears a handle 23. The second end portion 24 of lever 11 is located within a recess 25 of the seat-bearing plate 2 and carries a depending pin 26 having a head portion 27 fitting into a central upper bore 28 of ball member 18. The hydraulic system associated with actuator 20 is of a kind known per se and is so designed that when handle 11 is pulled up pin 26 with head 27 are depressed and through them actuator 20, whereby a piston (not shown) is actuated and the central post 4 is caused to emerge further out of base portion 5 thereby lifting the seat assembly 1, 2. For lowering the seat assembly, pressure acting on the above piston is released in a manner known per se, e.g. by the actuation of a pedal in the base portion of the chair (not shown).

It is further seen from Figs. 5, 6 and 7 that boss 19 is surrounded by a hoop 30 whose terminal portions 31 and 32 are associated with an eccentric 33 forming the terminal portion of the lever 13 which at its opposite end carries a handle 34, lever 13 is swingable about a pivot 35.

In the position shown in Figs. 5 and 6 hoop 30 is released and in consequence the ball-and-socket joint formed by ball member 18 and the socket inside boss 19 is freely

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articulable and the seat assembly 1, 2 can be tilted.

Within a spherical socket 31 in the median region of the periphery of ball member 18 there is located a ball 32 cooperating with a racing 33 of boss 19. Owing to such cooperation there is ensured a smooth swivel of the seat assembly around the central post 4 regardless of any tilt of the former. On the lower portion of ball 18 there are provided a number of stops 34 which limit the tilt of the seat assembly 1, 2 in any direction.

Once the seat assembly 1, 2 is tilted in any desired direction to any desired degree (subject to the limitation due to stops 34) hoop 30 is tightened by shifting lever 13 from the position shown in Figs. 5 and 6 to the alternative position shown in these Figures by way of a dash-dotted line. In consequence the hoop tightens boss 19 onto ball member 18 whereby the seat assembly 1, 2 is fixed in the horizontal or in any tilted position, which position can no longer be changed as long as hoop 30 remains tightened. However, even in that tightened position it is still possible to swivel the seat assembly due to the ballbearing effect provided by ball 32 and the associated racing 33.

Attention is now directed to Figs. 8 and 9 which show the gripper assembly by which rod 9 is held. As shown rod 9 is gripped by jaws 36 and 37 of which the former is the back wall and the latter the front wall of the assembly. Jaw 37 is wedge-shaped and has a recess 31 cooperating with a ball 39 held within a spherical socket 40 in an end portion 41 of lever 12. At its opposite end lever 12 comprises a handle 42. Lever 12 is hinged on a pivot 43 which is journaled in a pair of lugs 44 (only one of which is shown in Fig. 8).

Gripper assembly 8 comprises two integral brackets 45, 46, the latter comprising a slot 47 for the passage of lever 12.

Jaw 37 is swingable about a pivot 48 journalled in brackets 45 and 46.

In the position shown in Figs. 8 and 9 jaws 36 and 37 are in the locking position in which they bear tightly on rod 9 whereby the latter is immobilized. When now lever 12 is depressed into the position shown by way of a dash-dotted line in Fig. 8, ball 39 is removed from recess 38 and moves upward along the slanting surface of jaw 37. In consequence the latter can swing clockwise about pivot 48 whereby the grip on rod 9 is loosened and the latter can be raised or lowered as may be desired. Once rod 9 and the associated back 10 are adjusted in the desired position, lever 12 is raised again until ball 39 snaps into the recess 38 whereupon the assembly is locked again.

Attention is now directed to Figs. 10 and 11 in association with Figs. 6, 8 and 9. The seat-bearing plate 2 has two integral downward depending wall members 48 and 49 on which the gripper 8 is hingedly mounted by means of an axle 50. A spring 51 coiled around axle 50 has its two free ends on the one hand and its loop portion 52 on the other hand suitably arrested such that sleeve 8 with rod 9 and back 10 are tiltable about axle 50 against the action of spring 51.

Mounted on wall members 49 and 48 are a first shaft 53 (see Figs. 6, 8 and 9) and a second shaft 54 (see Fig. 10). A plurality of link members 55 engage on the one hand the first shaft 53 by means of snugly fitting holes (see Fig. 11) and on the other hand near their other ends the second shaft 54 by means of an oblong axial slot 56 so as to be axially displaceable relative to shaft 54. In each interstice between two neighbouring link members 55 there is located a spacer disc 57 which is mounted on shaft 54 by a snugly fitting central hole.

On one end of shaft 54 there is keyed a retainer member 57 accommodated within a bore in wall member 48 so as

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to be shiftable therein. Near the opposite end shaft 54 comprises a plate 59 and a helical spring 60 is coiled around the end portion of shaft 54 so as to be located within a socket 61 of a boss 62 of wall member 49. In the position shown in Fig. 10 spring 60 is relaxed.

On the outer side of plate 59 shaft 54 comprises a finger 63 whose end portion fits into a suitably shaped recess of a push bar 64 which forms an integral part of lever 14. At its inner end lever 14 is hingedly mounted on an axle 65 (see Fig. 6) journalled in brackets 66 and 67 of wall member 49. At its outer end lever 14 is fitted with a handle 68.

In the position of Fig. 10 in which the spring 60 is relaxed, shaft 54 is biased from left to right (with reference to Fig. 10) and in this position the retainer member 57 exerts pressure on the assembly of link members 55 and spacer disc 57 which are accordingly forced into a friction-clutching state and cannot be dislocated relative to each other and relative to shaft 54. Consequently the gripper 8 cannot be rotated about axle 50 with the result that the back assembly 8, 9, 10 is fixed in a given angular position. When now lever 14 is shifted from the position full drawn and shown in Fig. 10 into that shown in dashed lines in the same Figure, push bar 64 acts on finger 63 whereupon the second shaft 54 is pushed from left to right (with reference to Fig. 10) whereby retainer member 57 is pushed out of contact with the extreme link member 55 and the assembly of link members 55 and spacer discs 57 is released whereby the link members may be dislocated axially until either of the end portions of slots 56 abuts the shaft 54. In consequence the back assembly 8, 9, 10 is now tiltable about axle 50 whereby the angular position of back 10 can be readjusted. Once a desired angular position is reached, lever 14 is again depressed whereby shaft 54 returns into the locking position of Fig. 10.

5 Boss 19 and ball 18 which together form the ball-
and-socket joint of the swivel chair are best made of
plastic material. Such plastic material must combine high
impact and abrasion resistance with a low friction
coefficient and good elongation ability. A compounded
10 plastic material having the following composition was found
suitable:

	polyamide 6:6	-	58.4%
	ethylene-propylene-methyl rubber		
15	(maleic anhydride modified)	-	5 %
	polytetrafluoroethylene	-	6 %
	short glass fibres	-	30 %
	ethylene-maleicanhydride-acrylicacid		
	terpolymer	-	0.5%
20	aluminium stearate	-	0.5%

In this material the glass fibres are about 4.5 cm
long.

25 The above compounded plastic material was prepared
by first making the following mixture:

	polyamide 6:6 (pellets 60-65 RV, Du Pont)	-	58.4%
	ethylene-propylene-methyl rubber		
	(maleic anhydride modified powder, Exxon)	-	5 %
30	polytetrafluoroethylene (powder, Hoechst)	-	6 %
	ethylene-maleicanhydride-acrylicacid		
	terpolymer (pellets, Orchema)	-	0.5%
	aluminium stearate		
	(containing 10% free acid)	-	0.5%

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This mixture was fed into a double ribbon blender
and mixed for 20 mins. Thereafter it was dried for 4 hours
in a vacuum dessicator at 75°C and the so-dried mixture was
fed at a rate of 280 kg/hr into a double shaft kneader of

5 100 mm diameter and L/D=15+1 revolving at 500 rpm and fitted
with a side feeding arrangement. In consequence of the high
speed of the kneader the mixture heated up to 285°C to form
a melt and short glass fibres of an average length of 4.5 mm
(silane treated, Owens Corning) were continuously introduced
10 into the melt through the side feeder of the kneader at a
rate of 120 kg/hr so that its content in the melt was 30%.

At the discharge end the kneader was fitted with a
strand die and the discharged liquid mixture was forced
therethrough. The so-extruded strands were passed through a
15 quencher and then pelleted. The resulting pellets were dried
and were then ready for injection moulding.

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What is claimed is:

1. A swivel chair comprising:

(a) a seat

(b) a base

5 (c) a central post supported by the base and carrying at its top end a ball member mounted thereon;

(d) a seat-bearing plate having upper and lower faces and bearing the seat on its upper face;

10 (e) a boss projecting downward from the lower face of the seat-bearing plate and having a socket which receives the ball member of the central post to form therewith a ball-and-socket joint whereby said seat-bearing plate is capable of articulation by way
15 of swivelling and tilting; and

(f) manually-operated means for restraining the motion of the boss about the ball member, said manually-operated means having a locking position in which said boss is locked on said ball member and a
20 releasing position in which said boss can be articulated about said ball member.

2. A swivel chair according to Claim 1 including means for limiting the articulation of the seat-bearing plate by way of tilting.

25 3. A swivel chair according to Claim 1 wherein the central post is associated with means for the adjustment of the height of the seat.

4. A swivel chair according to Claim 3 wherein the means for the adjustment of the height of the
30 seat is hydraulic.

5. A swivel chair according to Claim 3 wherein the means for the adjustment of the height of the seat is pneumatic.

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6. A tilting and swivel mechanism for use in a swivel chair comprising:

(a) a ball member for mounting on the top of a central post of the chair;

5 (b) a seat-bearing plate having an upper face for bearing the chair's seat and a lower face;

(c) a boss projecting downward from the lower face of the seat-bearing plate and having a socket for receiving the ball member to form therewith a ball-and-socket joint whereby the seat-bearing plate is capable of articulation by way of swivelling and tilting; and

(d) manually-operated means for restraining the motion of the boss about the ball member, said manually-operated means having a locking position in which said boss is locked on said ball member and a releasing position in which said boss can be articulated about said ball member.

7. A mechanism according to Claim 6 including means for limiting the articulation of the seat-bearing plate by way of tilting.

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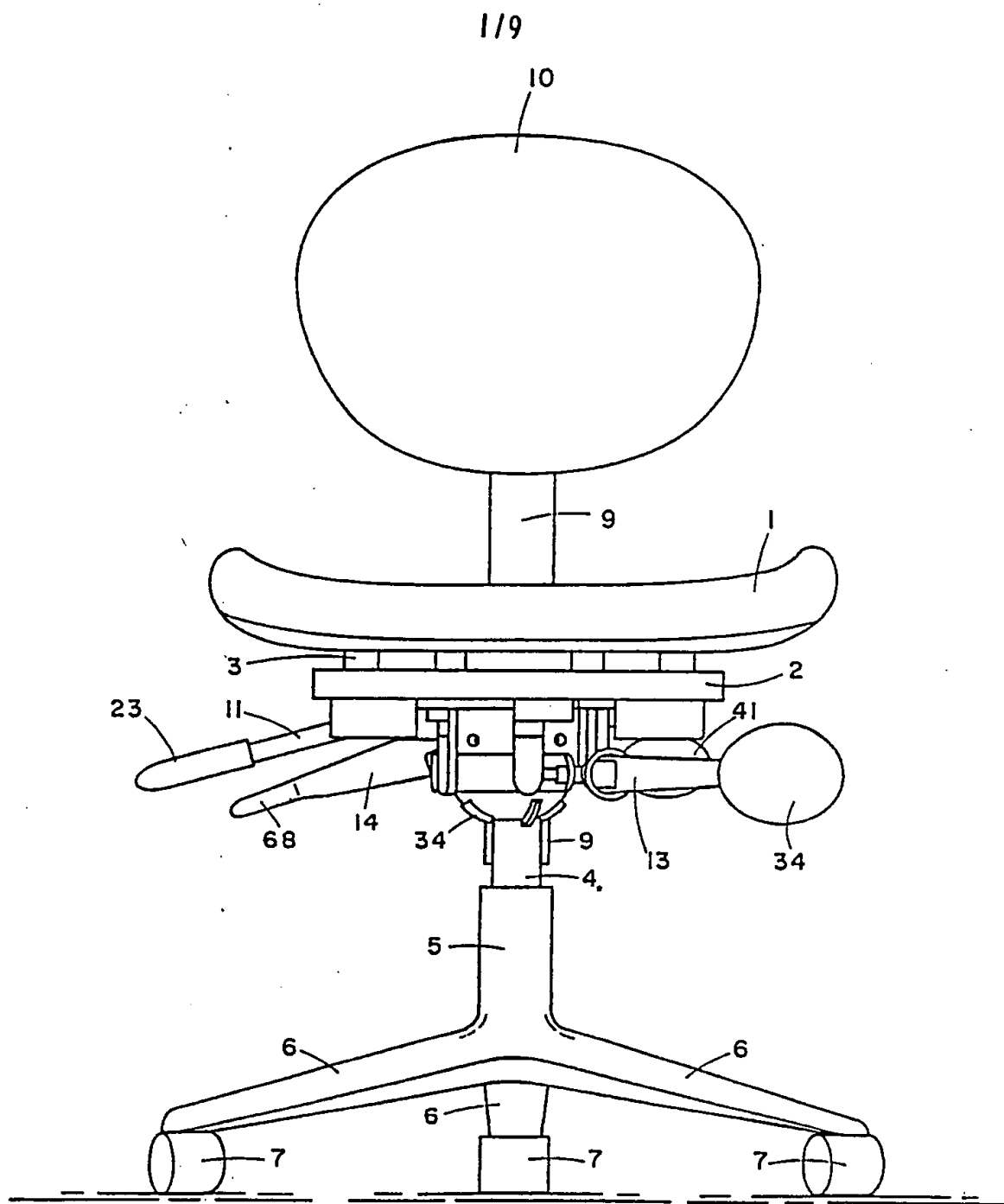


Fig. 1

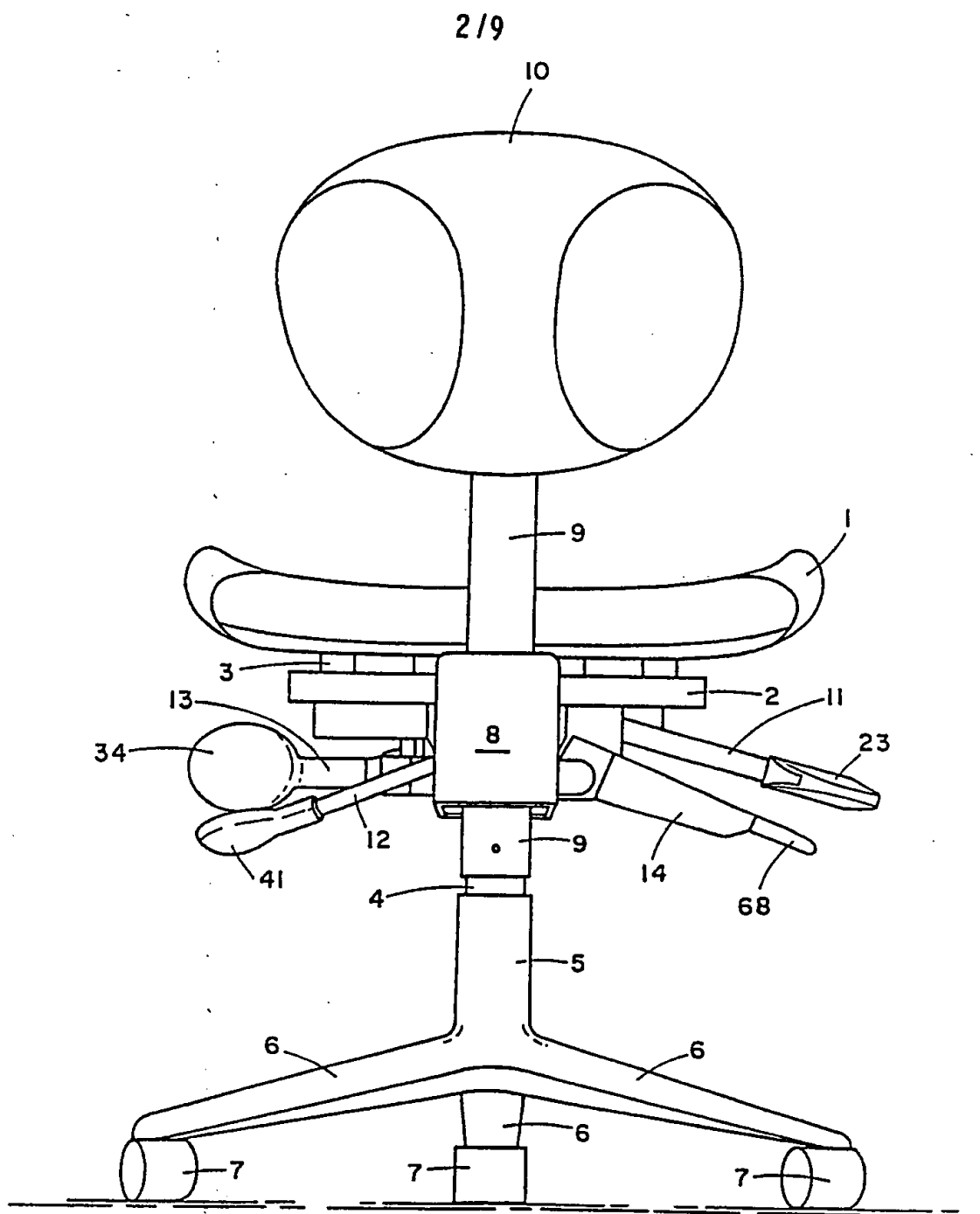
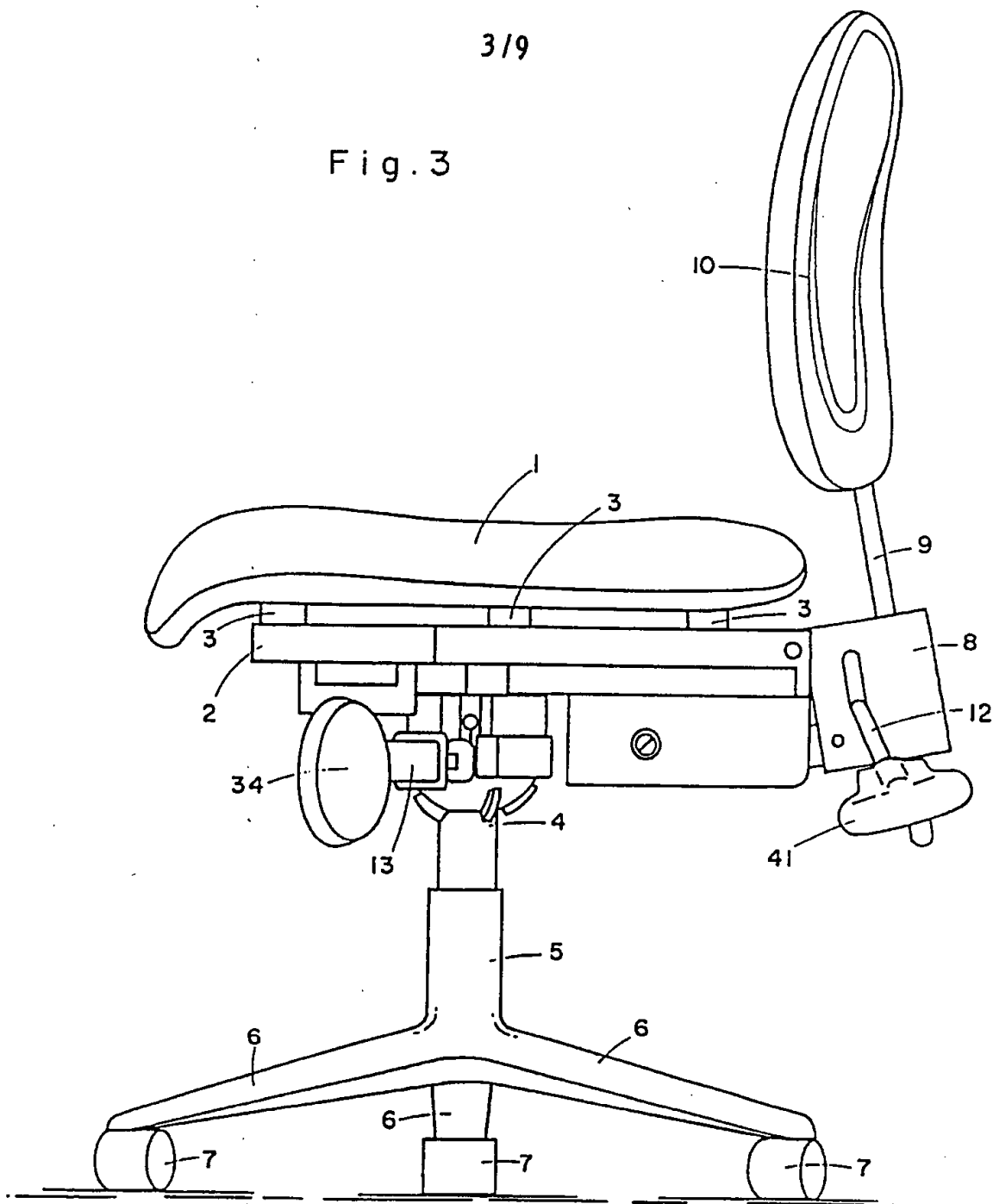


Fig.2

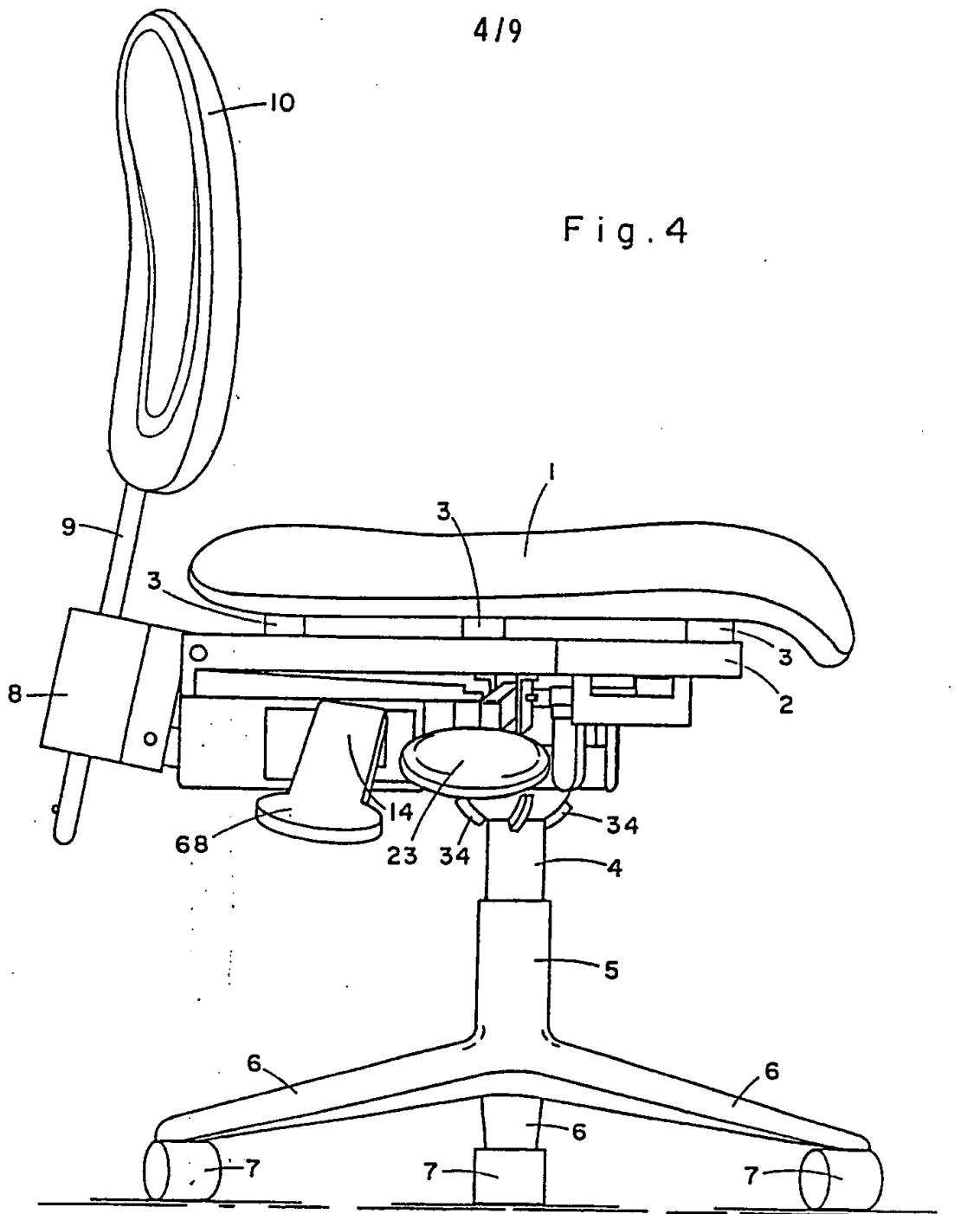
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Fig. 3



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Fig. 4



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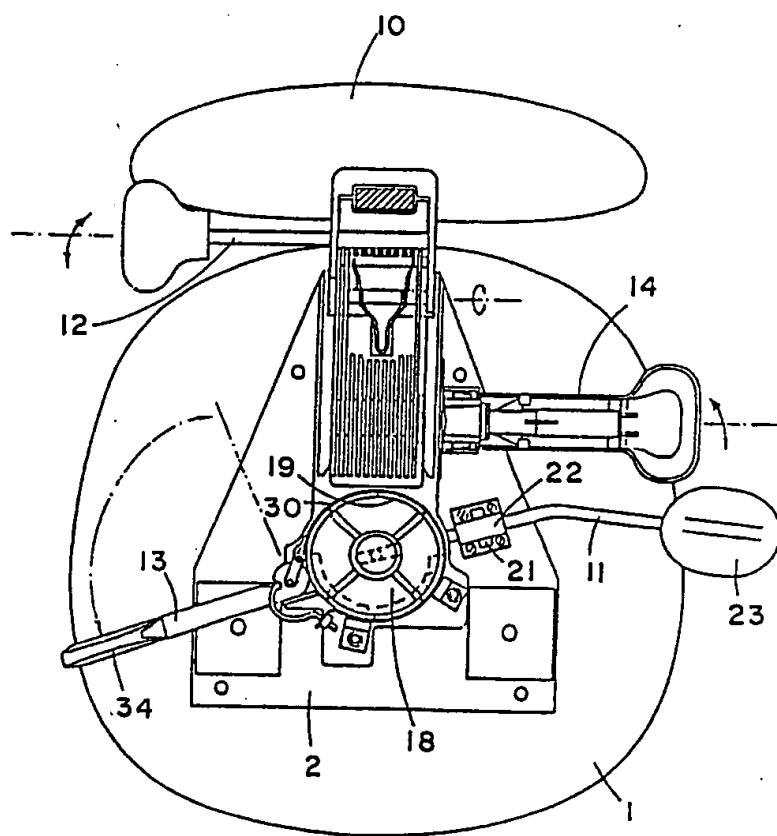


Fig. 5

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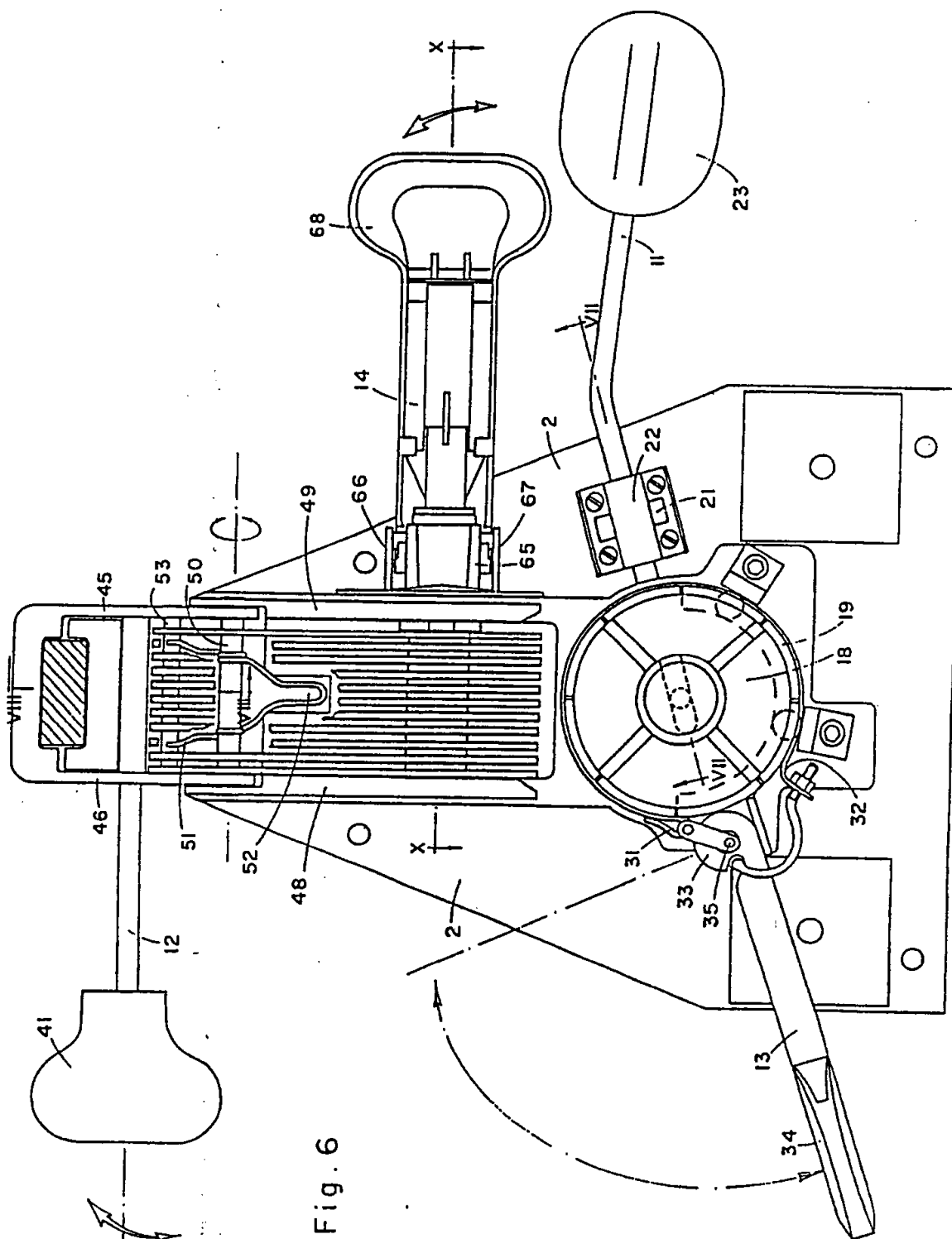


Fig. 6

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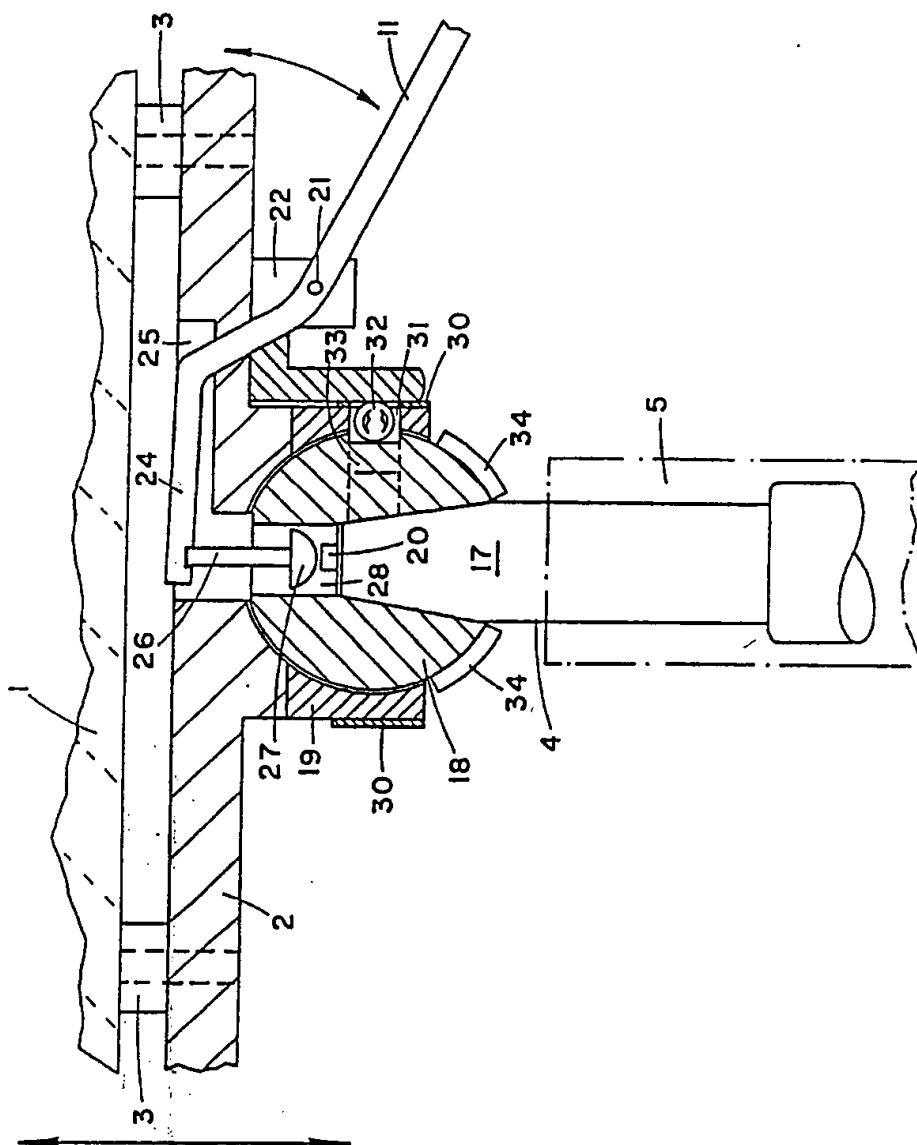


Fig. 7

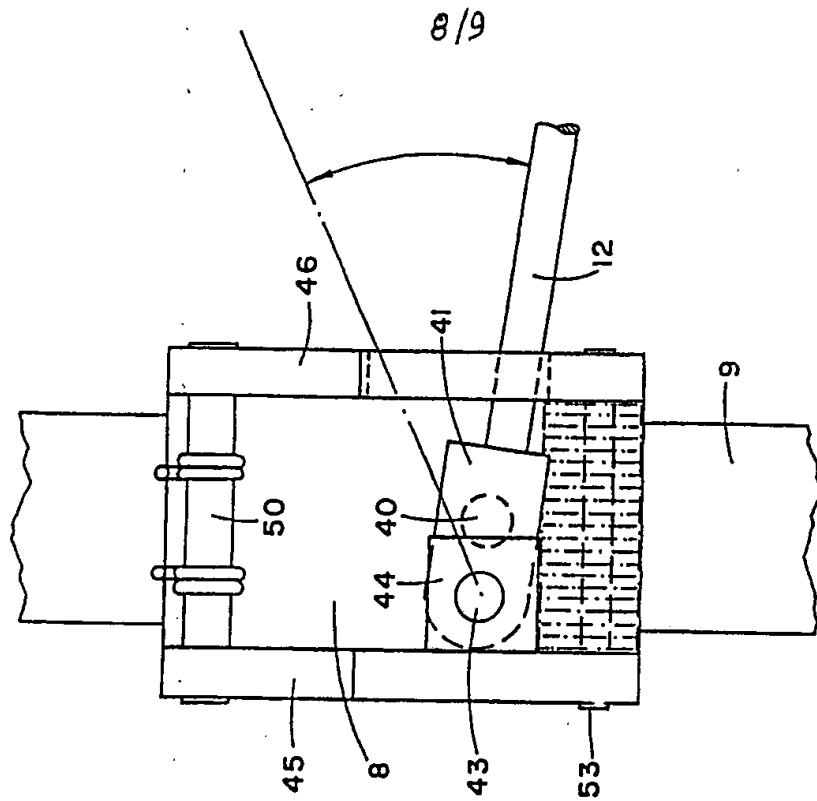


Fig. 9

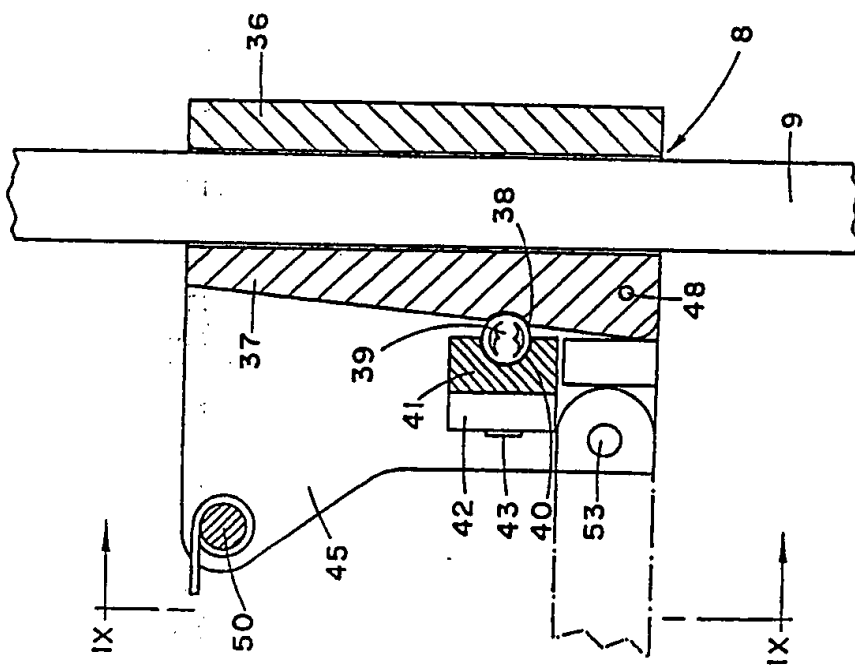


Fig. 8

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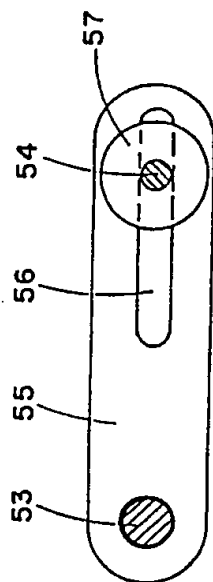


Fig. 11

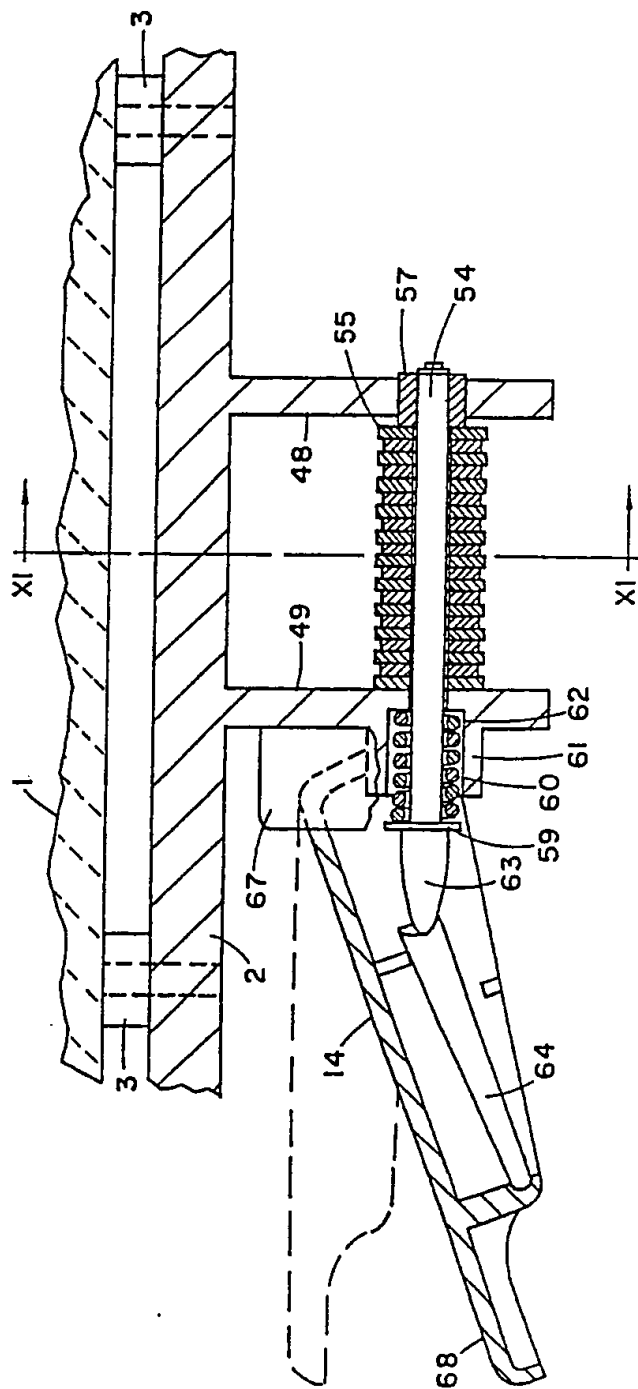


Fig. 10

INTERNATIONAL SEARCH REPORT

International Application No.

PCT/US90/02810

I. CLASSIFICATION OF SUBJECT MATTER (if several classification symbols apply, indicate all) *

According to International Patent Classification (IPC) or to both National Classification and IPC

IPC (5) : A47C 1/02

U.S. Cl : 297/325,327; 248/181; 403/90

II. FIELDS SEARCHED

Minimum Documentation Searched ?

Classification System

Classification Symbols

U.S.

297/313,325,326,327,345; 248/181,288.5; 403/90,131,143

Documentation Searched other than Minimum Documentation
to the Extent that such Documents are Included in the Fields Searched *

III. DOCUMENTS CONSIDERED TO BE RELEVANT *

Category *	Citation of Document, ¹¹ with indication, where appropriate, of the relevant passages ¹²	Relevant to Claim No. ¹³
X Y	US,A 730,690 (PALMER) 09 June 1903 See Figure 1.	<u>1-3,6,7</u> 4,5
Y	US,A 3,711,054 (BAUER) 16 January 1973 See Figure 1.	4
Y	US,A 4,072,288 (WIRGES ET AL) 07 February 1978 See Figure 8.	5
A	US,A 4,605,334 (KALVATN) 12 August 1986 See Figure 1.	1,6,7
A	US,A 4,807,841 (EDSTROM) 28 February 1989 See Figure 2.	1,6,7
(CON'T)		

* Special categories of cited documents: ¹⁰

"A" document defining the general state of the art which is not considered to be of particular relevance

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"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

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IV. CERTIFICATION

Date of the Actual Completion of the International Search

14 AUGUST 1990

Date of Mailing of this International Search Report

24 SEP 1990

International Searching Authority

ISA/US

Signature of Authorized Official

BRIAN K. GREEN *Brian K. Green*

NGUYEN NGOC-HO
INTERNATIONAL DIVISION

III. DOCUMENTS CONSIDERED TO BE RELEVANT (CONTINUED FROM THE SECOND SHEET)

Category *	Citation of Document, with indication, where appropriate, of the relevant passages	Relevant to Claim No
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A	US,A 4,796,508 (HOSHINO) See Figure 2.	10 January 1989 1,6
A	US,A 2,971,770 (WAGNER) See Figure 1.	14 February 1961 1,6
A	US,A 916,286 (EVANS) See Figure 1.	23 March 1909 1,6
A	US,A 420,968 (SEAMAN) See Figure 1.	11 February 1890 1,6
A	DE,A 2,925,520 (HENSEL) See Figure 1.	15 January 1981 1,6